Project 2: Milestone 1

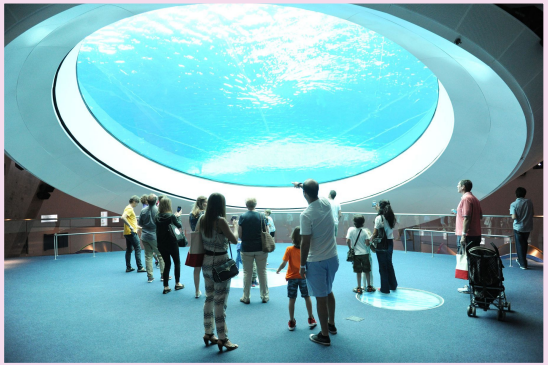
Team 3

Abigail Nicholas, Project Manager

Olga Pyalling, Dhwani Bhatt

Research

Audience

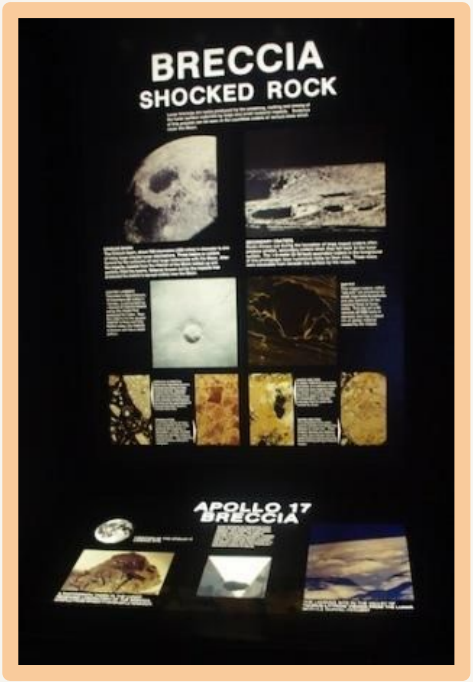


- **Target audience**
  - Elementary-aged students
- **Stakeholders**
  - Project Manager
  - Caretakers of elementary students
  - Educators
  - Museum staff

Market

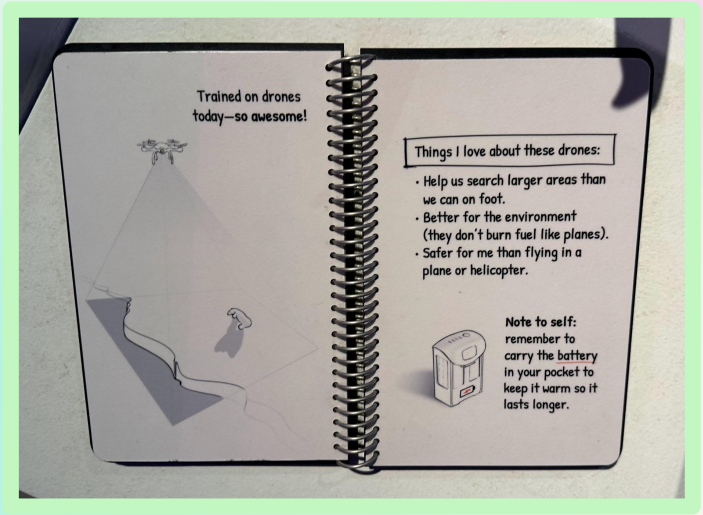
Within These Walls Exhibition at the American History Museum

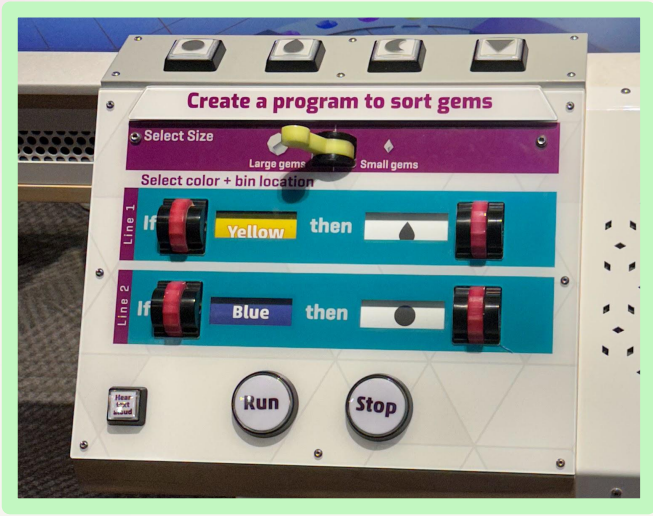
Air and Space Museum



Trip to the Museum of Science

Large, well-spaced, legible type





Labels using large text, bold colors, and shapes

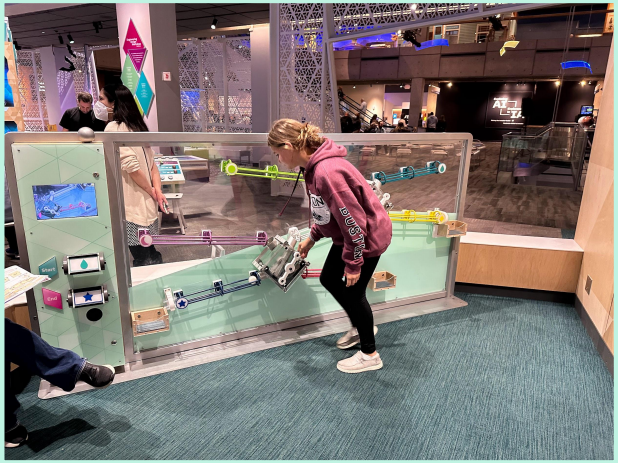
Trip to the Museum of Science

Wheelchair-friendly spaces

Wordless diagram with implied instructions

Trip to the Museum of Science

Use of bright colors, sensory surfaces, and interactive pieces



VSD Strategies

How can exhibits be altered to cater for specific groups of people such as children or disabled persons?

- Universal Pictograms for visitors with cognitive impairment
- Using tangible surfaces and technologies for engagement

Definition of Success

- Raise awareness of sustainable engineering
  - Prompts more discussion
- Present and educate importance of sustainable practices
  - User takes away sustainable systems for daily life
- Positive and memorable experience as a result of exhibit
- Accurate and complete yet succinct sustainability information

- Tactility
- Considers a range of cognitive and physical abilities
- Aims to engage users
- Color contrast
- Aesthetic appeal

Trends throughout Research

Problem Statement

What?

Design Challenge

Goals & Objectives

- Design an exhibit that successfully educates students on the importance of sustainability in engineering
- Engage elementary aged students through interactive elements
- Exhibit should be efficiently assembled, easy to put together/take apart and portable

Constraints

- Dimensions
- Cost
- User safety
- Utilize different interfaces

Group Goals and Client Needs

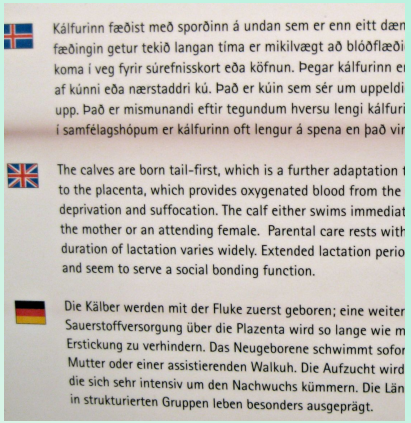
- Group Goals
  - Interactive display
  - Easy to assemble and take down
  - High durability
  - Building user intelligence through engaging design
  - EDGE and Universal Design principles

- Client Needs
  - Create a traveling museum
  - Use portable exhibits
  - Attract many customers

How?

Functions of Exhibit

- Accessible to different accommodations of the general public:
  - Wheelchair accessible
  - Hearing, vision impairment
  - Bilingual visitors
- To attract, entertain, and educate the public on sustainability



Why?

Benefits

For Society:

- Raises awareness on sustainability
  - Active discussion
  - More people will take action

For Client:

- Easily portable exhibits
- Widespread and accessible education

For User:

- Gains new knowledge in the field of sustainability
- Is entertained by participating in an engaging exhibit

Project 2: Milestone 2

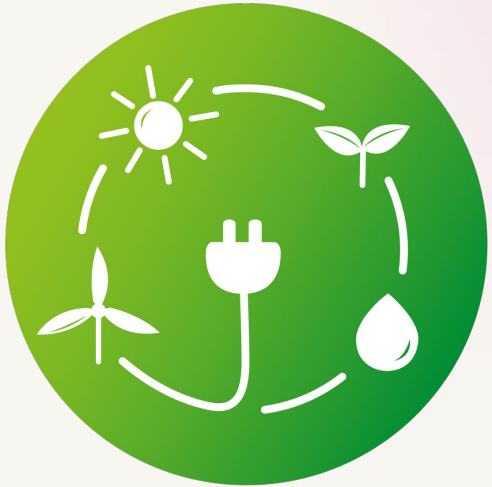
Team 3

Dhwani Bhatt, Project Manager

Olga Pyalling, Abigail Nicholas

Review

Previous Ideas and Decision Process



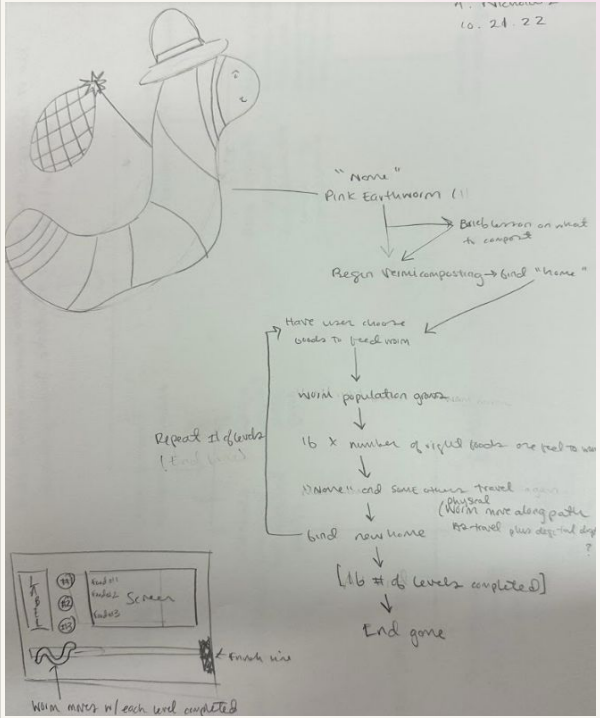
Green Energy

Water Purification

Vermicomposting

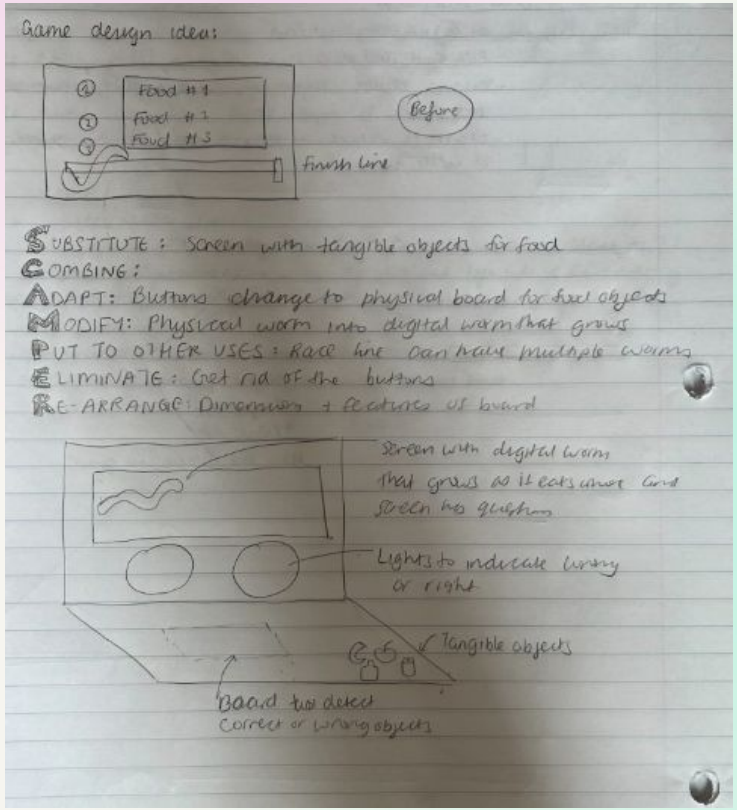
Ideation Techniques

Ideation Techniques



Hand Sketch + Flow Chart

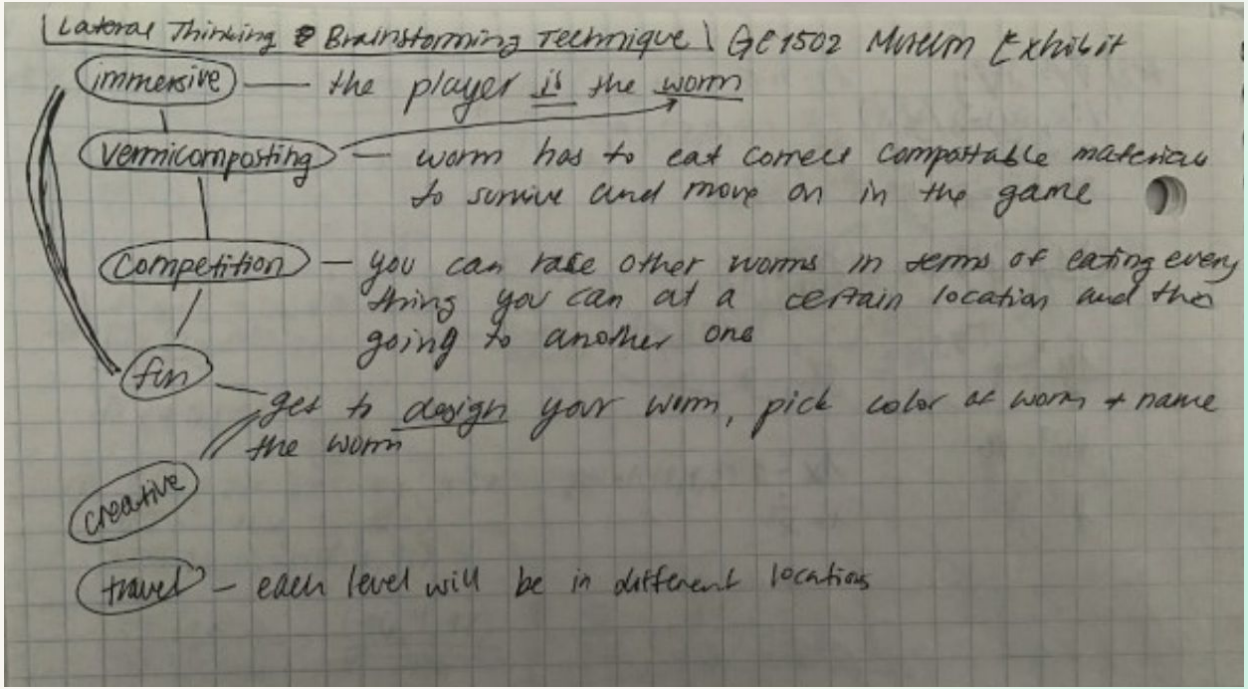
Game Approach- Abby



Vertical Thinking

Tangible Interaction- Dhwani

Ideation Techniques



Lateral Thinking
Immersive Experience- Olga

KTDA

Kepner-Tregoe Decision Analysis

	Alternatives						
Musts		**Abby**		**Olga**		**Dhwani**	
Portable (fits within travel container, meets required dimensions)		GO		GO		GO	
Visually appeal		GO		GO		GO	
Interactive		GO		GO		GO	
Safety		GO		GO		GO	
Addresses sustainability		GO		GO		GO	
Caters to elementary-aged audience		GO		GO		GO	
Opportunity for accessibility (bilingual, wheelchair-accessible, considers colorblindness)		GO		GO		GO	
Wants	**Weights**	**Rating**	**D=RxW**	**Rating**	**D=RxW**	**Rating**	**D=RxW**
Tangibility	8	5	40	5	40	9	72
User involvement (How much does the user do?)	9	7	63	7	63	9	81
Durability	8	9	72	9	72	5	40
TOTAL			175		175		193

Problem Statement Updates

Design an portable exhibit that educates students on the importance of sustainable engineering in a way that engages elementary-aged students in various locations and is widely accessible to the general public. Our solution will focus on vermicomposting in an interactive, efficiently assembled, and durable exhibit. Fulfilling the project constraints, the design will have dimensions of a length less than 36” and depth less than 28”, cost less than $100, guarantee safety, and provide concise instructions in both English and Spanish. While integrating VSD, our exhibit will include wheelchair accessible spaces, color customization to cater to color-blindness, and tangible pieces simulating compostable items.

Thank you!
Questions?

Do you have any suggestions for designing our tangible pieces?

- Material
- Circuit construction

Adjustments or suggestions for our targeted accessibility features?

Sources

Green Energy|| Wikipedia
VermiComposting|| Shutterstock
Water Purification|| Aquaswift

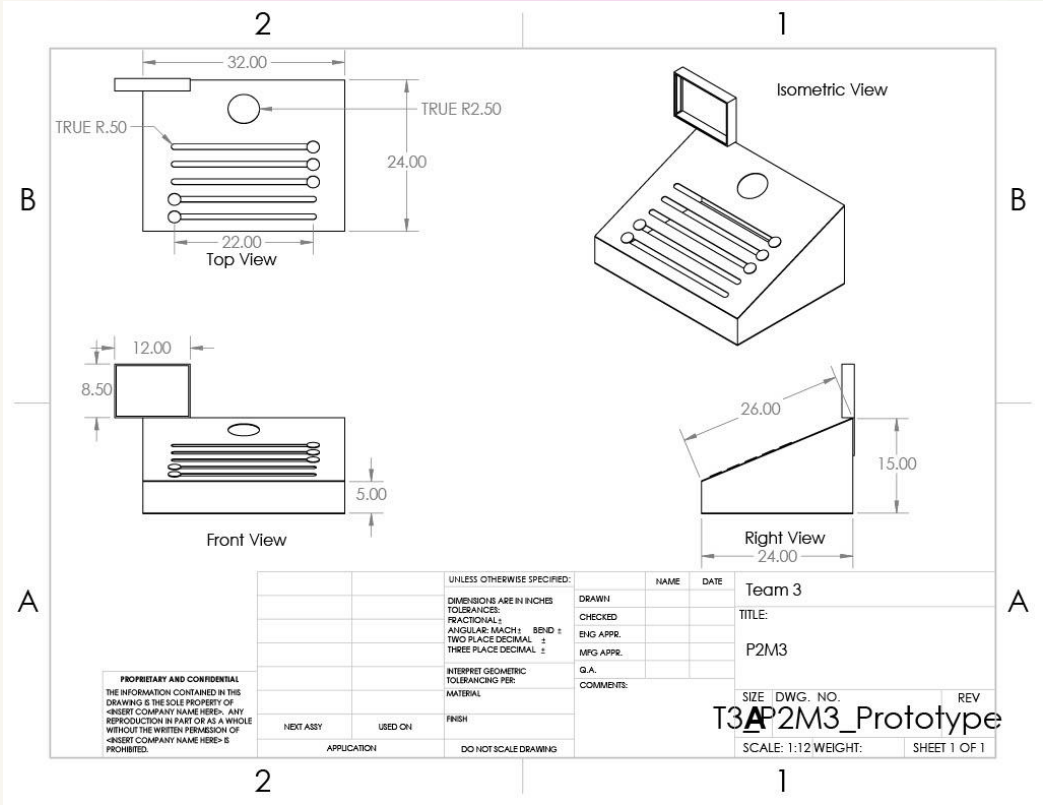
Project 2: Milestone 3

Team 3

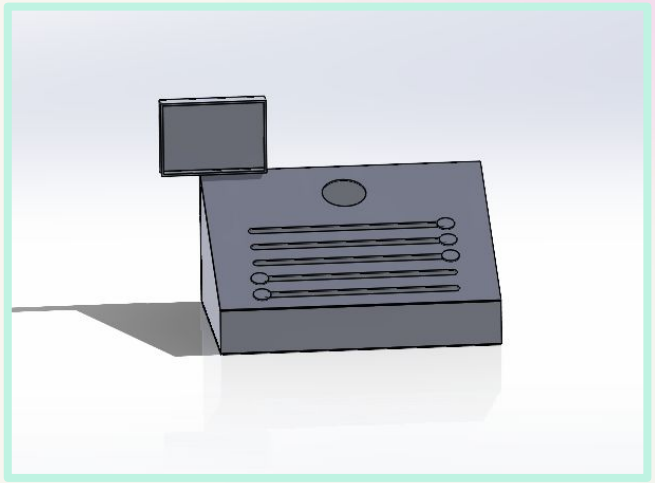
Abigail Nicholas, Project Manager

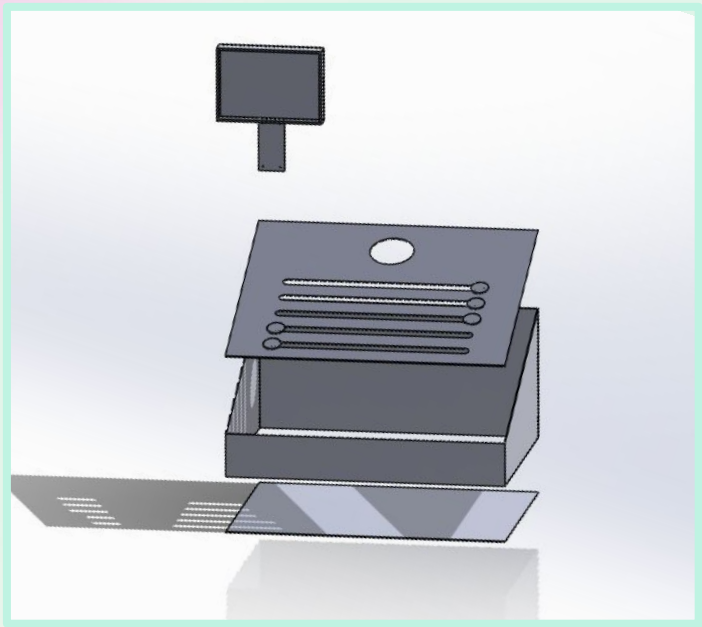
Olga Pyalling, Dhwani Bhatt

CAD Drawing: SolidWorks



CAD Drawing: SolidWorks





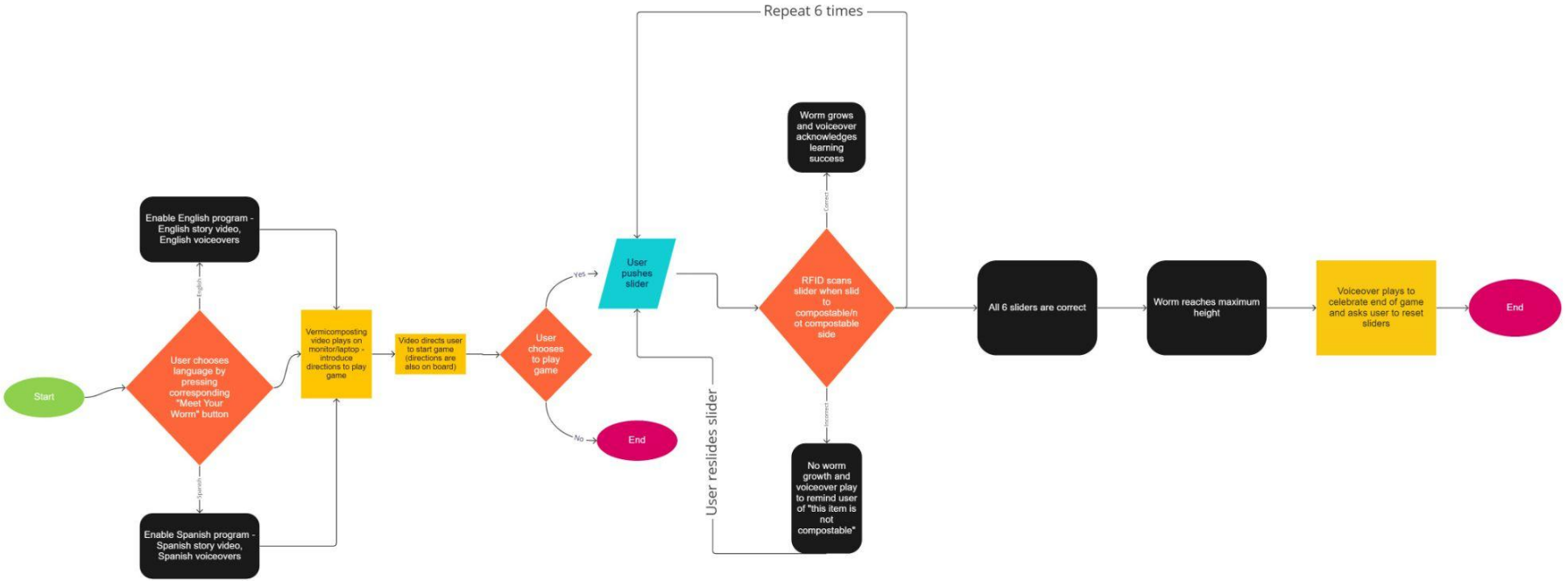
Bill of Materials and Budget

TEAM 3 PROJECT 2 BOM & BUDGET

	Items	Source	Quantities	Price
Electronics/ Sparkfun	Motor	FYELIC	1	$0.00
	RFID Components	FYELIC	10	$0.00
	Buttons	Sparkfun	2	$25.90
	Jumper cables	Sparkfun Kit	TBD	$0.00
	Redboard	Sparkfun Kit	1	$0.00
	Breadboard	Sparkfun Kit	1	$0.00
General Items	¼” x 2 ft x 4 ft Plywood	Home Depot	2	$42.00
	Hinges	Dhwani	5-10	$0.00
	Recycled materials for design	Will collect from our own waste and recycling bins		$0.00
	Textured Crafts Tissue Paper	Abby	-	$0.00
	3d Printing Materials	Included in COE 3D printing hours	TBD	$0.00
Items for Poster Board	Colored Paper	Abby	TBD	-
	Markers, paint, designing materials	Abby	-	$0.00
	Glue	Abby	-	$0.00
	Masking Tape	General Store	1	$3.50
			TOTAL	$71.40

User Interaction: Electronics

Team 3 P2M3 User Interaction Flowchart



Refined Problem Statement

Design a portable exhibit that educates students on the importance of sustainable engineering in a way that engages elementary-aged students in various locations and is widely accessible to the general public. The solution will focus on vermicomposting in an interactive and durable exhibit. **The exhibit will be portable by employing a foldable design with hinges where the bottom of the exhibit will be detachable for an effective assembly**. Fulfilling the project constraints, the design **will have a length of 34” and depth of 26”**, cost less than $100, guarantee safety, and provide concise auditory and visual instructions in both English and Spanish. While integrating VSD, the exhibit will include wheelchair accessible spaces, color customization to cater to color-blindness, and **tangible moving pieces with limited mobility such as sliders.**

Q&A and Suggestions

- ★ How can we lengthen our time of engagement?
- ★ How can we effectively create/enhance a bilingual experience?
- ★ Any structural change suggestions?
- ★ Suggestions for creating a sensory surface? What materials can mimic a dirt texture?

Project 2: Milestone 4

Team 3

Olga Pyalling, Project Manager

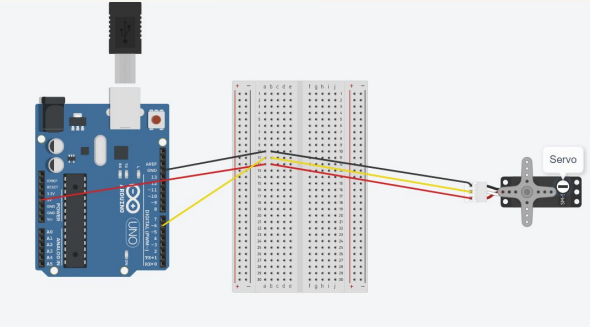
Dhwani Bhatt, Abigail Nicholas

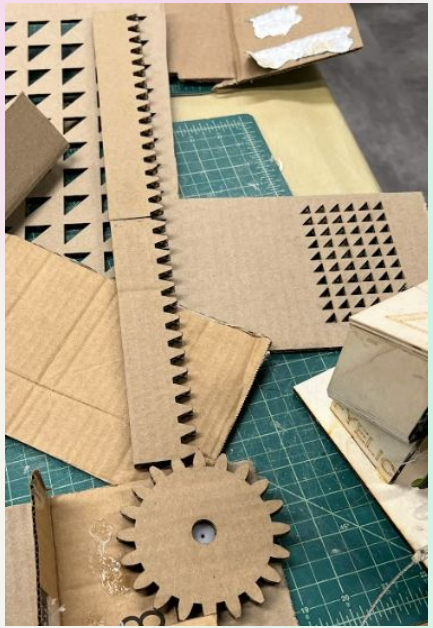
Evolution of Exhibit

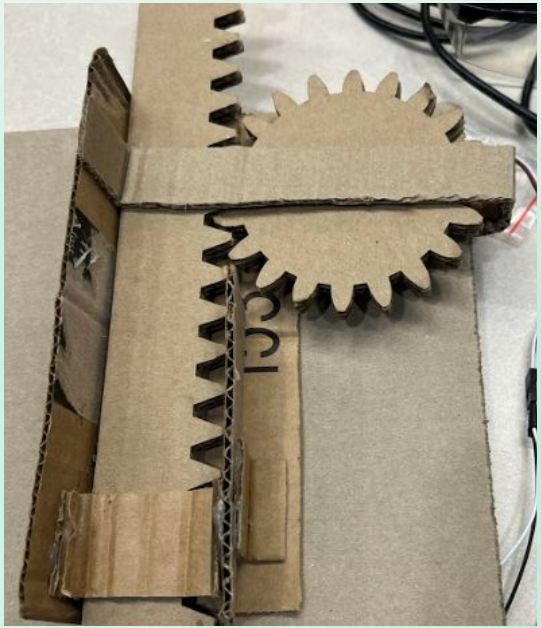
- Reduced size of exhibit
  - Conserve materials
- Decided not to make it foldable
  - Instead, L brackets and nails
- Still need to make top piece with cut-outs for sliders and worm

Proof of Concept: Growing Worm

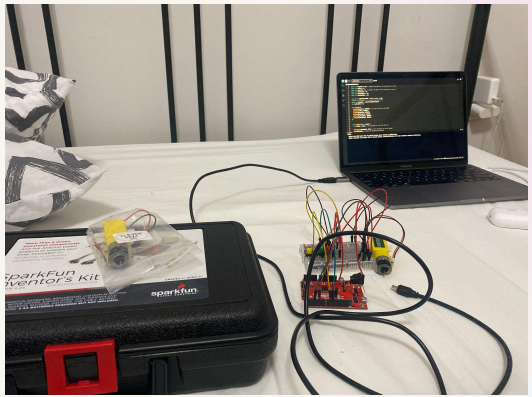
- Rack and Pinion gear system
- Laser cut cardboard pieces
- Used a servo motor to rotate the piece
- Link to youtube video

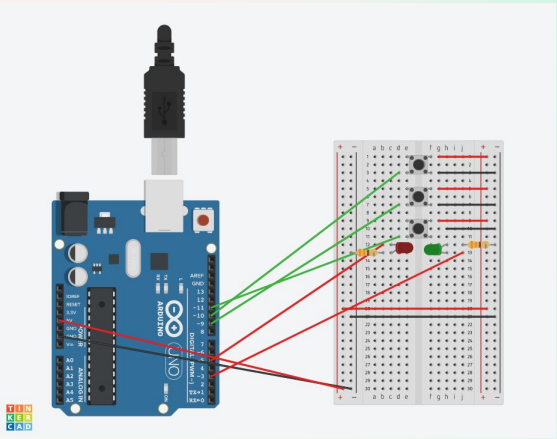






Proof of Concepts: Correct/Wrong Visual Representation





- 3 Push Buttons
  - Correct
  - Wrong
  - Reset
- 2 LED Lights
  - Green (Correct)
  - Red (Wrong)
- Youtube Link:
  - https://youtube.com/shorts/PgZw6sei-Fc?feature=share

Feedback Planning

- Capturing Data:
  - Serial monitor to time each answer between the sliders to gauge learning
  - Keeps track of the amount of times it takes the user to get the correct answer
  - Keep track of English and Spanish speakers
- Analysis of Data:
  - Design graphics and tables
  - Insight on distribution of language usage
- Plan:
  - Connect computer to Arduino code, keep it running
  - Keep track of amount of times English vs. Spanish button is pressed for instructions through code
  - Present ideas to 4th and 5th graders for input

Updated Problem Statement

Design a portable exhibit that educates students on the importance of sustainable engineering in an engaging, travel-friendly, safe, and widely accessible manner. The solution will focus on vermicomposting in an interactive and durable exhibit. **Constructed of locally-sourced plywood**, the trapezoidal-prism design has a **length of 22”, depth of 15”, and maximum height of 15”** and fulfills both the project and bag dimension constraints. The final design will cost less than $100 and provide concise instructions in both English and Spanish, **based on the user’s button selection**. While integrating VSD, the exhibit will be accessible to various heights, including those in wheelchairs and **require minimal physical effort** through the use of tangible sliding pieces. **Additionally, the game encasement will be a tactile surface created with recyclable materials mimicking dirt and waste products. The overall success of this exhibit will be measured by a user’s performance and determined by data collecting whether the correct answer was chosen in the first attempt. An optional Google Form will also be available via QR code.**

Thank you for listening! We need some help from you too...

- Alternatives to RFID tags on the sliders
  - Alternative idea: Closing circuit?
- How to improve the amount of weight that the servo and pinion can push up in the growing worm mechanism
- How else to collect data and feedback from user other than through code
- How to reset overall program/exhibit